DOINGWHATWORKS

Presentation

FULL DETAILS AND TRANSCRIPT

Using a Number Line to Teach Fractions

Madison Elementary School, Washington • May 2008

Topic: National Math Panel: Critical Foundations for Algebra

Practice: Mathematics Preparation for Algebra

Highlights

- Uses of an open number line for moving beyond counting
- Demonstration of recording problems using an open number line
- Demonstration of an open number line with two scales for adding and subtracting fractions
- Writing equations
- Students address a word problem, some using double scaled open number lines and showing their solutions

About the Site

Madison Elementary School

Spokane, WA

Demographics

76% White

6% Hispanic

5% Black

3% Asian
2% Native American
24% Free or Reduced-Price Lunch
3% English Language Learners
18% Special Education

Madison has put many practices and strategies in place to "leave nothing to chance" when it comes to teaching mathematics. The staff has deliberately reviewed all aspects of instruction and have well-developed approaches in the following areas:

- Philosophy of building conceptual understanding, problem solving, and fluency with facts;
- Using an open number line to teach fractions;
- Teachers' strategies for encouraging effort, including messages to parents about the importance of effort and persistence;
- Assessment grids used to track performance on benchmark assessments to analyze individual needs and whole class needs for re-teaching; and,
- Structured protocol for reviewing student work.

Full Transcript

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Welcome to Using Number Lines to Teach Fractions

Slide 2

At Madison Elementary, an open number line has become an invaluable tool for students to use with addition and subtraction of whole numbers and fractions. An open number line is just an empty line used to record mental strategies.

Slide 3

With representations on the open number line, students move beyond counting by ones, to taking leaps, decomposing numbers, and using landmark numbers.

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Third grade teacher, Christian Skalstad, demonstrates how students might record on an open number line

doing the subtraction problem 437 minus 265.

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And another example is they could solve 437 minus 265 using the open number line. So they could start with 265 and count up to 437 to find out the difference. So a student might start with 265 plus 10 gets them to a landmark number of 275 and then add another 25 to get to 300, always keeping in mind where they want to go and end up. Then they might add another 100 on to that, which should get them to 400 and then add on 37 to get to 437.

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So once they get to this point; then they need to look and see how much it took to get from 265 to 437, so they would start with 100 plus 37 plus 25 plus the 10. Some of the students who are more fluent mathematically might be able to deal with the 37, others might break it down into a 25 and a 10 and a 2. So they have the 100 plus the 25 plus the 25 is 150, and they have the 10 and the 10 which is 20 and two left, 150 plus 20 is 170 plus 2 equals 172.

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An open number line with two scales ("double-scaled") becomes a tool for adding and subtracting fractions.

Instructional math coach, Sharon Leonard demonstrates how students might use this tool calculating one-fourth plus one-fifth.

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We use the double open number line quite a bit for fifth and sixth graders. Double open number line is a little different than a regular number line in that it has fractions running across the top and whole numbers running across the bottom so that children could begin to see proportional reasoning and almost an idea of ratio. So they can use the double number line for many things, for equivalents, for adding and subtracting fractions. One example might be, they were given the equation one-fourth plus one-fifth. As we get further along, we will let the children tell us what they would like for their whole number to be represented on this number line. For this problem children will most likely pick 20, and let's try that first. And they will pick 20 because they have done a lot of work with factors and they know that four and five are factors of 20, so see one would be here, and 20 would be here.

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So they might first then say, "Well, I am going to take my one-fourth here, and represent it with this jump." We also talk about how our open number lines don't have to be to scale, they have to be approximate. So here is about one-fourth—our numbers, however, have to be accurate—and if we were taking a bike trip for example, that was a 20-mile bike trip and we were one-fourth of the way, we would have traveled five miles. So we have represented our one-fourth and they might at one-fifth, and one-fifth of 20 would be four miles, which we will represent here, which gives us a total of nine miles, so our fraction for one-fourth plus one-fifth would be 9 out of 20 or 9/20. So they can complete their equation.

Slide 10

Another student might use 100 as the whole number that they wanted to work with, because they might like working with percentages. So their number line still needs to be about the same length so we can compare them in a minute here, so here's zero, here's 100 and our first jump here at one-fourth, and now if we are thinking out of 100, our kids are pretty fluent with percentages and they would be able to tell us that one-fourth of 100 is 25%, so they would be able to put their 25 here, representing 25 miles if you were thinking of a bike course, and then here's their jump of one-fifth, and one-fifth of a 100 is 20, for a total here of 45. The fraction might be 45 out of a 100 which leads to a great discussion of equivalent fractions. Here we have 9/20, here we have 45/100. Are they the same or do they have different values? And how can we discuss that, how can we prove that.

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Sixth grade students present their solutions to a problem about Frank's Fresh Farm where he must decide whether he has enough gas for a trip he is planning. The problem presents information both in "miles" and in "fractions" of a tank of gas.

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Students used a number of visual representations, but most found the double-scaled number line a useful tool.

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Notice how here students use a double-scaled number line, with one scale representing the gas gauge, and the other the miles traveled.

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In the investigation of this problem, students found that the open double-scaled number line represents "equivalence" and is a useful tool for addition and subtraction of fractions.

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To learn more about teaching fractions, please see the additional materials on the Doing What Works website.